THEORY OF COMPUTATION

1. How many two state DFA's can be constructed over the alphabet Σ = {a, b}, with designated initial state?

(a) 4
(b) 16
(c) 64
(d) 128

2. How many 3 state DFA's with designated initial state can be constructed over the alphabet Σ={a, b} _____.

3. Find the no. of DFA's that can be constructed over the alphabet Σ with 5 symbols, and with 10 states.

(a) $2^{50} \times 50^5$
(b) $2^{10} \times 10^{50}$
(c) $2^5 \times 10^{50}$
(d) $2^{50} \times 50^{10}$

4. How many 2 state DFA's with designated initial state can be constructed over the alphabet Σ = {a, b} that accept empty language ϕ ?

(a) 4
(b) 16
(c) 20
(d) 24

5. How many 2 state DFA's with designated initial state can be constructed over the alphabet over the alphabet Σ = {a, b} that accept universal language?

(a) 4
(b) 16
(c) 20
(d) 24

6. Which of the following statement(s) are true about NFA & DFA?

(i) NFA is more powerful than DFA but DFA is more efficient than NFA.
(ii) NFA will respond for only valid inputs and no need to respond for invalid inputs.
(iii) There is no concept of dead states and complement in NFA.
(iv) NFA is a parallel computing system where we can run multiple threads concurrently.

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(a) only (i) & (ii) are true
(b) only (ii) & (iii) are true
(c) only (iii), (iv) & (i) are true
(d) All statements are true

7. Which of the following is a Regular language?

(a) $L_1 = \{wcw^R \mid w \in \{a, b\}^*\}$
(b) $L_2 = \{wcw^R \mid w,c \in \{a, b\}^*\}$
(c) $L_3 = \{ww^Rc \mid w \in \{a, b\}^*\}$
(d) $L_4 = \{cww^R \mid w \in \{a, b\}^*\}$

8. Given that a language $L = L_1 \cup L_2$, where L_1 and L_2 are two other languages. If L is known to be a regular language, then which of the following statements is necessarily TRUE?

(a) If L_1 is regular then L_2 will also be regular
(b) If L_1 is regular and finite then L_2 will be regular
(c) If L_1 is regular and finite the L_2 will also be regular and finite
(d) None of these

9. Let L be the language represented by the regular expression $\Sigma^*0011\Sigma^*$ where $\Sigma = \{0, 1\}$. What is the minimum number of states in a DFA that recognizes $\bar{L}$?

(a) 4
(b) 5
(c) 6
(d) 8

10. Choose the correct statement for the following regular expression over the symbols 0 & 1.

$$0(0+1)^*0 + 1(0+1)^*1$$

(a) To represent all strings over 0's and 1's
(b) To represent all strings which start with 0's and end with 1's
(c) To represent all strings which start and end with same symbol
(d) To represent all strings that starts and ends with 1's

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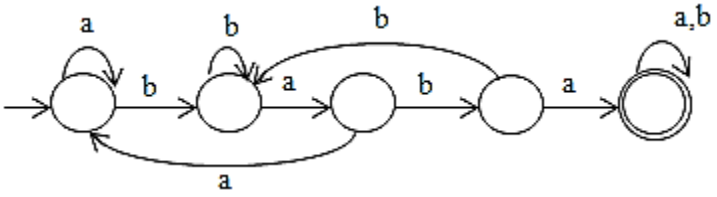
11. Consider the following DFA:



Which of the following is true for the above DFA?

(a) It recognizes the strings which contains ‘ababa’ as substring
(b) It recognizes the strings which contains ‘abbaba’ as substring
(c) It recognizes the strings which contains ‘abbabaa’ as substring
(d) It recognizes the strings which contains ‘baba’ as substring

12. Which of the following regular expression generates the set of all strings not containing ‘baa’ as a substring over input alphabet {a, b}?

(a) a*(b*a)*
(b) a*b*ab
(c) a*baba*
(d) a*(ba+b)*

13. Identify the regular expression which denotes all strings of a’s and b’s where each string contains at least two b’s.

(a) (a+b)*ba*b
(b) (a+b)*ba*ba
(c) (a+b)*ba*b(a+b)*
(d) None of these

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